

What is claimed:

1. A safety device for a motor-vehicle steering column and seat belts, comprising
a pair of bearing boxes, each of which is rigidly attached to a torque box and in a rear
5 portion of a deformable longitudinal runner, facing a passenger compartment and
having the greatest stiffness;
at least one pair of independently operating piston devices, each of which, arranged in a
front section of a vehicle body, consists of a piston head, located in the vicinity of a
front bumper, a wire-guiding member, connected to a deformable element, attached to
10 the passenger compartment, and a piston rod, which, guided by the bearing box, is
movable in the longitudinal runner, where the piston head and the wire-guiding member
are fastened to front and rear portions of the piston rod;
a seat-belt wire, wound about pivots, attached to the torque box and a pair of side rails,
and pivots of both wire-guiding members, where both ends of the seat-belt wire are
15 connected to at least one pair of energy-absorbing, vibration-dampening delimiters,
fastened to stiff motor-vehicle members, with sites of predetermined fracture in
connection with the seat belts;
two steering-column wires, each of which, provided with a wire holder and an energy-
absorbing steering-column delimiter with at least one site of predetermined fracture, is
20 connected to the wire-guiding member and wound about pivots, and
a collapsible casing, arranged between a collapsible upper portion of the steering column
with a steering wheel and a non-collapsible lower portion thereof, attached to a dash
panel, where the collapsible upper portion thereof has a threaded stud, which,
accommodating both wire holders, has a threaded end projection onto which a nut is
25 bolted to secure them;
whereby in the event of a front collision an impact energy displaces the front bumper and at
least one piston head, a movement of which results in
deforming the respective longitudinal runner, loosely guided by the piston rod, and
deflecting the respective wire-guiding member in association with deforming the
30 deformable element, the respective energy-absorbing, vibration-dampening delimiter
and the energy-absorbing steering-column delimiter and collapsing the collapsible
upper portion of the steering column with the steering wheel;

absorbing the impact energy and dampening a vibration;
releasing the respective steering-column wire and
pre-tensioning the seat belts of belted passengers up to a predetermined length of a seat-belt retraction.

- 5 2. A safety device for a motor-vehicle steering column and seat belts, comprising
at least one pair of independently operating piston devices, each of which, arranged in a
front section of a vehicle body, has a piston rod, which, arranged to a longitudinal
runner, has a front portion, fastened to a front portion of the longitudinal runner, a mid-
portion, loosely guided by a bearing of a dash panel, reinforced, and a rear portion, to
10 which a wire-guiding member is fastened, where the bearing is provided with a
soundproofing bush;
a seat-belt wire, wound about pivots, attached to a torque box and a pair of side rails, and
pivots of both wire-guiding members, where both ends of the seat-belt wire are
connected to at least one pair of energy-absorbing, vibration-dampening delimiters,
15 fastened to stiff motor-vehicle members, with sites of predetermined fracture in
connection with the seat belts;
two steering-column wires, each of which, provided with a wire holder and an energy-
absorbing steering-column delimiter with at least one site of predetermined fracture, is
connected to the wire-guiding member and wound about pivots, and
20 a collapsible casing, arranged between a collapsible upper portion of the steering column
with a steering wheel and a non-collapsible lower portion thereof, attached to a dash
panel and the torque box, where the collapsible upper portion thereof has a threaded
stud, which, accommodating both wire holders, has a threaded end projection onto
which a nut is bolted to secure them;
25 whereby in the event of a mid-front collision an impact energy displaces the front bumper
and both piston heads, a movement of which results in
deforming both longitudinal runners and deflecting both wire-guiding members in
association with deforming both energy-absorbing, vibration-dampening delimiters and
both energy-absorbing steering-column delimiters and collapsing the collapsible upper
30 portion of the steering column with the steering wheel;
absorbing the impact energy and dampening a vibration;
releasing both steering-column wires and

pre-tensioning the seat belts of belted passengers up to a predetermined length of a seat-belt retraction.

3. A safety device for a motor-vehicle steering column and seat belts, comprising
- at least one pair of independently operating piston devices, each of which, arranged in a
- 5 front section of a vehicle body, has a piston rod, which, arranged to a longitudinal runner, has a front portion, fastened to a front portion of the longitudinal runner, a mid-portion, loosely guided by a soundproofing bearing of a dash panel, reinforced, and a rear portion, to which a wire-guiding member is fastened;
- a seat-belt wire, wound about pivots, attached to a torque box and a pair of side rails, and
- 10 pivots of both wire-guiding members, where both ends of the seat-belt wire are connected to at least one pair of energy-absorbing, vibration-dampening delimiters, fastened to stiff motor-vehicle members, with sites of predetermined fracture in connection with the seat belts;
- two steering-column wires, each of which, provided with a wire holder and an energy-
- 15 absorbing steering-column delimiter with at least one site of predetermined fracture, is connected to the wire-guiding member and wound about pivots, and
- a collapsible casing, arranged between a collapsible upper portion of the steering column with a steering wheel and a non-collapsible lower portion thereof, attached to the dash panel and the torque box, where the collapsible upper portion thereof has a threaded
- 20 stud, which, accommodating both wire holders, has a threaded end projection onto which a nut is bolted to secure them;
- whereby in the event of a front collision an impact energy displaces the front bumper and at least one piston head, a movement of which results in
- deforming the respective longitudinal runner, loosely guided by the piston rod, and
- 25 deflecting the respective wire-guiding member in association with deforming the deformable element, the respective energy-absorbing, vibration-dampening delimiter and the energy-absorbing steering-column delimiter and collapsing the collapsible upper portion of the steering column with the steering wheel;
- absorbing the impact energy and dampening a vibration;
- 30 releasing the respective steering-column wire and
- pre-tensioning the seat belts of belted passengers up to a predetermined length of a seat-belt retraction.

4. The safety device according to claim 1, further comprising

a cone-shaped hub, which, facing the longitudinal runner, is provided for each piston head, whereby in the event of the front collision at least one piston head deforms the deformable longitudinal runner, the wire-guiding member deforms the deformable element and the
5 energy-absorbing steering-column delimiter and the respective hub reams the longitudinal runner, during which the piston rod, guided by the respective bearing box and the hub, loosely guides the longitudinal runner thereby

preventing buckling;

achieving the highest efficiency in absorbing the impact energy and

10 dampening the vibration.

5. The safety device according to claim 4, wherein the delimiter of the seat belts consists of a spring, shock absorber and delimiting unit, comprising a support member with a plate, biased by a spring, and a tube, which, movable in the support member and provided with a notch, at least one site of predetermined fracture and a number of adjusting holes, is moved
15 by a tension force of the seat-belt wire until the biased plate snaps into the notch to block further movement and limit retraction-lengths of the seat belts, where when the tension force is great the site of predetermined fracture is fractured and the seat-belt wire is released.

6. The safety device according to claim 3, further comprising

a guide assembly, a retaining assembly and a blocking assembly, each assembly consists of
20 a guiding member and a mating longitudinally guided member, of a key and a mating receptacle and of a contacted member and a mating blocking member, each of all three members and each of all three mating members are provided for a retaining member and a mating clamping member of the delimiter of the seat belts, where the mating clamping member is provided with at least one site of predetermined fracture and with a
25 number of adjusting holes and a pre-wire of the seat belts and the seat-belt wire are connected to free rear and free front portions;

whereby in the event of the front collision the seat-belt wire, loaded, pulls the mating clamping member, a movement of which, guided by the guiding member, along the retaining member, fastened to the stiff motor-vehicle member, results in

30 engaging the key with the mating receptacle and contacting the contacted member with the mating blocking member;

absorbing the impact energy, dampening the vibration and releasing the seat-belt wire in association with a work of deformation and friction and fracturing the site of predetermined fracture and

preserving a clamping force of the clamping member and retraction-lengths of the seat belts.

7. The safety device according to claim 6, wherein a longitudinal gap serves as the longitudinally guided member of the clamping member, which, pre-loaded, arranged on the retaining member with a longitudinal strut, serving as the guiding member.

8. The safety device according to claim 7, wherein a contact area of the portion of the retaining member is surrounded by a soundproofing material.

9. The safety device according to claim 8, wherein a pair of retaining apertures on the longitudinal gap of the clamping member serves as the receptacle and a two-side retaining strut on a longitudinal strut of the retaining member serves as the key.

10. The safety device according to claim 9, wherein a blocking pin, serving as the blocking member, projects through a rear portion of the clamping member and a fork-shaped wire holder of the pre-wire of the seat belts and both end projections are secured by securing parts and a surface of the retaining member, facing the blocking pin, serves as the contacted member, where the blocking assembly with a clearance of (s_2) and the retaining assembly with a clearance of (s_1), which is bigger than (s_2), are in engagement thereby facilitating a blocking operation while maintaining a retaining condition upon further movement of the clamping member under load of the impact energy, when great,

to release the seat-belt wire in association with fracturing the site of predetermined fracture and

to preserve the clamping force of the clamping member and the predetermined length of the seat-belt retraction.

11. The safety device according to claim 10, wherein the clamping member, when moving along the retaining member, expands.

12. The safety device according to claim 11, wherein portions of the clamping member and the retaining member, which are in contact, are defined by conical forms which are similar.

13. The safety device according to claim **6**, wherein a longitudinal gap serves as the longitudinally guided member of the clamping member, which, pre-loaded, arranged in the retaining member with a guide pin, serving as the guiding member.

5 **14.** The safety device according to claim **13**, wherein a contact area of the portion of the clamping member is surrounded by a soundproofing material.

15. The safety device according to claim **14**, wherein a retaining collar on the rear end of the clamping member serves as the key and the retaining member is provided with a retaining notch, serving as the receptacle, and a cone-shaped chamfer at an end portion to assist a process of engaging the retaining collar with the retaining notch.

10 **16.** The safety device according to claim **15**, wherein a pair of open notches of the retaining member serves as the contacted member to receive a pair of guide sleeves of a blocking pin, where the blocking pin, projecting through the rear portion of the clamping member, a wire holder of the pre-wire of the seat belts and the pair of guide sleeves, serving as the blocking member, on the clamping member, has end projections, secured by securing parts, where the
15 blocking assembly and the retaining assembly with a clearance of (s_3) are in engagement thereby facilitating a blocking operation while maintaining a state of retaining upon further movement of the clamping member under load of the impact energy, when great,
to release the seat-belt wire in association with fracturing the site of predetermined fracture
and
20 to preserve the clamping force of the clamping member and the retraction-lengths of the seat belts.

17. The safety device according to claim **16**, wherein the clamping member, when moving along the retaining member, contracts.

25 **18.** The safety device according to claim **17**, wherein portions of the clamping member and the retaining member, which are in contact, are defined by conical forms which are similar.

19. The safety device according to claim **2**, wherein a number of adjusting holes is distributed along the rear portion of the piston rod.

20. The safety device according to claim **19**, wherein the wire-guiding member has a longitudinal hole to accommodate the rear portion of the piston rod, to which the wire-

guiding member and the wire holder of the steering-column wire are fastened by a fastener, and a web with a transverse hole, serving as the pivot of the seat-belt wire.

21. The safety device according to claim 3, wherein a number of adjusting holes is distributed along the front and rear portions of the piston rod.

5 22. The safety device according to claim 21, wherein the steering-column delimiter comprises a support plate with an aperture, a tube with at least one site of predetermined fracture and with a number of adjusting holes and a blocking member, which, projecting through a transverse hole of the rear portion of the tube, has end projections, secured thereon by securing parts, where a fracture occurs when a deflection of the delimiter exceeds a
10 distance between the blocking member, bigger than the aperture of the support plate, and the support plate, fixed to the stiff motor-vehicle member.

23. The safety device according to claim 22, wherein the rear portion of the piston rod is fastened to a longitudinal hole of the wire-guiding member, which has a web with a transverse hole, serving as the pivot of the seat-belt wire, and another longitudinal hole to
15 accommodate the steering-column delimiter, an appropriate adjusting hole of which is occupied by the wire holder of the steering-column wire.

24. The safety device according to claim 3, wherein the delimiters of the seat belts and steering column are plates, where a mid-portion of each plate is provided with at least one site of predetermined fracture, a front portion has a number of adjusting holes, one of which
20 is occupied by a first delimiter-wire, and a rear portion has a number of adjusting holes, one of which is occupied by a second delimiter-wire.

25. The safety device according to claim 24, wherein the first delimiter-wire is movable with the wire-guiding member and the second delimiter-wire, inserted into a hole of a stiff holder, fastened to the stiff motor-vehicle member, has a blocking member, a distance
25 between which and the hole thereof is adjusted by clamping a spacer with open profile and an appropriate length onto the second delimiter-wire.

26. A safety device for a motor-vehicle steering column and seat belts, comprising a pair of bearing boxes, each of which is rigidly attached to a torque box and in a front portion of a deformable longitudinal runner, facing a passenger compartment and
30 having the greatest stiffness;

at least one pair of independently operating piston devices, each of which, arranged in a rear section of a vehicle body, consists of a piston head, located in the vicinity of a rear bumper, a wire-guiding member, connected to a deformable element, attached to the passenger compartment, and a piston rod, which, guided by the bearing box, is movable
5 in the longitudinal runner, where the piston head and the wire-guiding member are fastened to rear and front portions of the piston rod;

a seat-belt wire, wound about pivots, attached to a torque box and a pair of side rails, and pivots of both wire-guiding members, where both ends of the seat-belt wire are connected to at least one pair of energy-absorbing, vibration-dampening delimiters,
10 fastened to stiff motor-vehicle members, with sites of predetermined fracture in connection with the seat belts;

two steering-column wires, each of which, provided with a wire holder and an energy-absorbing steering-column delimiter with at least one site of predetermined fracture, is connected to the wire-guiding member and wound about pivots, and

15 a collapsible casing, arranged between a collapsible upper portion of the steering column with a steering wheel and a non-collapsible lower portion thereof, attached to a dash panel, where the collapsible upper portion thereof has a threaded stud, which, accommodating both wire holders, has a threaded end projection onto which a nut is bolted to secure them;

20 whereby in the event of a rear collision an impact energy displaces the rear bumper and at least one piston head, a movement of which results in

deforming the respective longitudinal runner, loosely guided by the piston rod, and deflecting the respective wire-guiding member in association with deforming the deformable element, the respective energy-absorbing, vibration-dampening delimiter
25 and the energy-absorbing steering-column delimiter and collapsing the collapsible upper portion of the steering column with the steering wheel;

absorbing the impact energy and dampening a vibration;

releasing the respective steering-column wire and

pre-tensioning the seat belts of belted passengers up to a predetermined length of a seat-
30 belt retraction.

27. A safety device for a motor-vehicle steering column and seat belts, comprising

at least one pair of independently operating piston devices, each of which, arranged in a rear section of a vehicle body, has a piston rod, which, arranged to a longitudinal runner, has a rear portion, fastened to a rear portion of the longitudinal runner, a mid-portion, loosely guided by a bearing of a rear panel of a passenger compartment,
5 reinforced, and a front portion, to which a wire-guiding member is fastened, where the bearing is provided with a soundproofing bush;

a seat-belt wire, wound about pivots, attached to a torque box and a pair of side rails, and pivots of both wire-guiding members, where both ends of the seat-belt wire are connected to at least one pair of energy-absorbing, vibration-dampening delimiters,
10 fastened to stiff motor-vehicle members, with sites of predetermined fracture in connection with the seat belts;

two steering-column wires, each of which, provided with a wire holder and an energy-absorbing steering-column delimiter with at least one site of predetermined fracture, is connected to the wire-guiding member and wound about pivots, and

15 a collapsible casing, arranged between a collapsible upper portion of the steering column with a steering wheel and a non-collapsible lower portion thereof, attached to a dash panel and the torque box, where the collapsible upper portion thereof has a threaded stud, which, accommodating both wire holders, has a threaded end projection onto which a nut is bolted to secure them;

20 whereby in the event of a mid-rear collision an impact energy displaces the rear bumper and both piston heads, a movement of which results in

deforming both longitudinal runners and deflecting both wire-guiding members in association with deforming both energy-absorbing, vibration-dampening delimiters and both energy-absorbing steering-column delimiters and collapsing the collapsible upper
25 portion of the steering column with the steering wheel;

absorbing the impact energy and dampening a vibration;

releasing both steering-column wires and

pre-tensioning the seat belts of belted passengers up to a predetermined length of a seat-belt retraction.

30 **28.** A safety device for a motor-vehicle steering column and seat belts, comprising at least one pair of independently operating piston devices, each of which, arranged in a rear section of a vehicle body, has a piston rod, which, arranged to a longitudinal

runner, has a rear portion, fastened to a rear portion of the longitudinal runner, a mid-portion, loosely guided by a soundproofing bearing of a rear panel of a passenger compartment, reinforced, and a front portion, to which a wire-guiding member is fastened;

5 a seat-belt wire, wound about pivots, attached to a torque box and a pair of side rails, and pivots of both wire-guiding members, where both ends of the seat-belt wire are connected to at least one pair of energy-absorbing, vibration-dampening delimiters, fastened to stiff motor-vehicle members, with sites of predetermined fracture in connection with the seat belts;

10 two steering-column wires, each of which, provided with a wire holder and an energy-absorbing steering-column delimiter with at least one site of predetermined fracture, is connected to the wire-guiding member and wound about pivots, and
a collapsible casing, arranged between a collapsible upper portion of the steering column with a steering wheel and a non-collapsible lower portion thereof, attached to the dash
15 panel and the torque box, where the collapsible upper portion thereof has a threaded stud, which, accommodating both wire holders, has a threaded end projection onto which a nut is bolted to secure them;

whereby in the event of a rear collision an impact energy displaces the rear bumper and at least one piston head, a movement of which results in

20 deforming the respective longitudinal runner, loosely guided by the piston rod, and deflecting the respective wire-guiding member in association with deforming the deformable element, the respective energy-absorbing, vibration-dampening delimiter and the energy-absorbing steering-column delimiter and collapsing the collapsible upper portion of the steering column with the steering wheel;

25 absorbing the impact energy and dampening a vibration;
releasing the respective steering-column wire and
pre-tensioning the seat belts of belted passengers up to a predetermined length of a seat-belt retraction.

29. The safety device according to claim **26**, further comprising

30 a cone-shaped hub, which, facing the longitudinal runner, is provided for each piston head, whereby in the event of the rear collision at least one piston head deforms the deformable longitudinal runner, the wire-guiding member deforms the deformable element and the

energy-absorbing steering-column delimiter and the respective hub reams the longitudinal runner during which the piston rod, guided by the respective bearing box and the hub, loosely guides the longitudinal runner thereby

preventing buckling;

5 achieving the highest efficiency in absorbing the impact energy and dampening the vibration.

30. The safety device according to claim 29, wherein the delimiter of the seat belts consists of a spring, shock absorber and delimiting unit, comprising a support member with a plate, biased by a spring, and a tube, which, movable in the support member and provided with a
10 notch, with at least one site of predetermined fracture and a number of adjusting holes, is moved by a tension force of the seat-belt wire until the biased plate snaps into the notch to block further movement and limit retraction-lengths of the seat belts, where when the tension force is great the site of predetermined fracture is fractured and the seat-belt wire is released.

15 31. The safety device according to claim 28, further comprising a guide assembly, a retaining assembly and a blocking assembly, each assembly consists of a guiding member and a mating longitudinally guided member, of a key and a mating receptacle and of a contacted member and a mating blocking member, each of all three members and each of all three mating members are provided for a retaining member
20 and a mating clamping member of the delimiter of the seat belts, where the clamping member is provided with at least one site of predetermined fracture and with a number of adjusting holes and a pre-wire of the seat belts and the seat-belt wire are connected to free rear and free front end portions;

whereby in the event of the rear collision the seat-belt wire, loaded, pulls the clamping
25 member, a movement of which, guided by the guiding member, along the retaining member, fastened to the stiff motor-vehicle member, results in

engaging the key with the mating receptacle and contacting the contacted member with the mating blocking member;

absorbing the impact energy, dampening the vibration and releasing the seat-belt wire in
30 association with a work of deformation and friction and fracturing the site of predetermined fracture and

preserving a clamping force of the clamping member and retraction-lengths of the seat belts.